FRED Reports

STREAM AND FISHERIES REHABILITATION
ACTIVITIES AT FISH CREEK - HYDER
by
Paul Novak
Number 7

Alaska Department of Fish & Game
Division of Fisheries Rehabilitation,
Enhancement and Development

ACTIVITIES/PROGRESS REPORT

STREAM AND FISHERIES REHABILITATION ACTIVITIES AT FISH CREEK - HYDER

by
Paul Novak

Number 7

Alaska Department of Fish and Game
Division of Fisheries Rehabilitation,
Enhancement & Development

Don W. Collinsworth
Commissioner

Stanley A. Moberly
Director

P.O. Box 3-2000
Juneau, Alaska 99802

August 1983

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Annual flooding of the Salmon River at Hyder, Alaska has damaged habitat that is irreplaceable. However, during the 1970s and 1980s, cooperating agencies have made advances in partially reclaiming salmon spawning habitat in a tributary to the river, Fish Creek. Adult chum salmon, *Oncorhynchus keta*, utilize this watershed and are a unique stock due to the large average size; 9 kg. Streambed modification and debris removal have helped stabilize the chum salmon population. Future activities are planned to complement these accomplishments.

KEY WORDS: Fish Creek - Hyder, chum salmon, habitat, rehabilitation, reclamation.

INTRODUCTION

Fish Creek, a tributary to the Salmon River (Figures 1 and 2) located 2 road miles northeast of Hyder, Alaska, is unique for its large chum salmon, *Oncorhynchus keta*. John H. Helle (1974) reported that the Fish Creek chum salmon may be the largest in North America. Biologists have recorded chum salmon weighing more than 17 kg, with an average weight of more than 9 kg.

According to local Hyder residents, mining and logging along the Salmon River, have created environmental changes that may be permanent. My investigations into these comments demonstrated that they were factual. The severe flooding in Fish Creek during the 1960s and early 1970s was caused by damming the upper watershed on the Summit Lake to the Bell Irving River drainage in British Columbia. As a result, Summit Lake (Figure 3 and 4) annually increases in pool size and creates hydraulic pressure that blows out under the glacier (Figure 5 and 6) toward the headwater side of the Salmon River, instead of dumping out on the Canadian side of the Summit. Helle reported that, annually, up to 70,800 l/s of water suddenly dumps into the Salmon River.

Annual flood waters carry large debris loads downstream (Salmon River) and deposit large silt-laden gravel bars, boulders, and trees in the Fish Creek area. To protect the road that services Granduc Mining Company's interests near Summit Lake, a dike was built in 1972 by the Alaska Department of Highways and the mining concern. Another high volume flood occurred in 1973 that destroyed 914 meters of road, the dike, and inundated the productive spawning areas of Fish Creek (Figure 7 and 8).

A massive dike system that protected both the road and Fish Creek from the Salmon River 1974 floods was constructed through cooperative efforts of State agencies, the U.S. Forest Service, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the Granduc Mining Company.

Each year since 1974, the trail dike has been improved and maintained. These annual dike improvements have protected the Fish Creek area from silt, gravel, and timber debris. Upwelling ground water into Fish Creek was again detectable in the upper spawning areas and the Fish Creek channel stabilized, to some degree, as early as 1975.

DISCUSSION

Fish Creek Habitat and Fisheries Rehabilitation

Protection and stabilization of Fish Creek watershed was the first phase of the fisheries rehabilitation program. Phase two of the program was started in 1977 when the Fisheries Rehabilitation, Enhancement and Development Division (FRED) secured funds for the Alaska Department of Highways to remove log jams and overburdens of gravel and silt from the upper and middle sections of the spawning areas. Instream work was accomplished by tracked heavy equipment between 1-15 June 1977 (Figures 9 and 10).

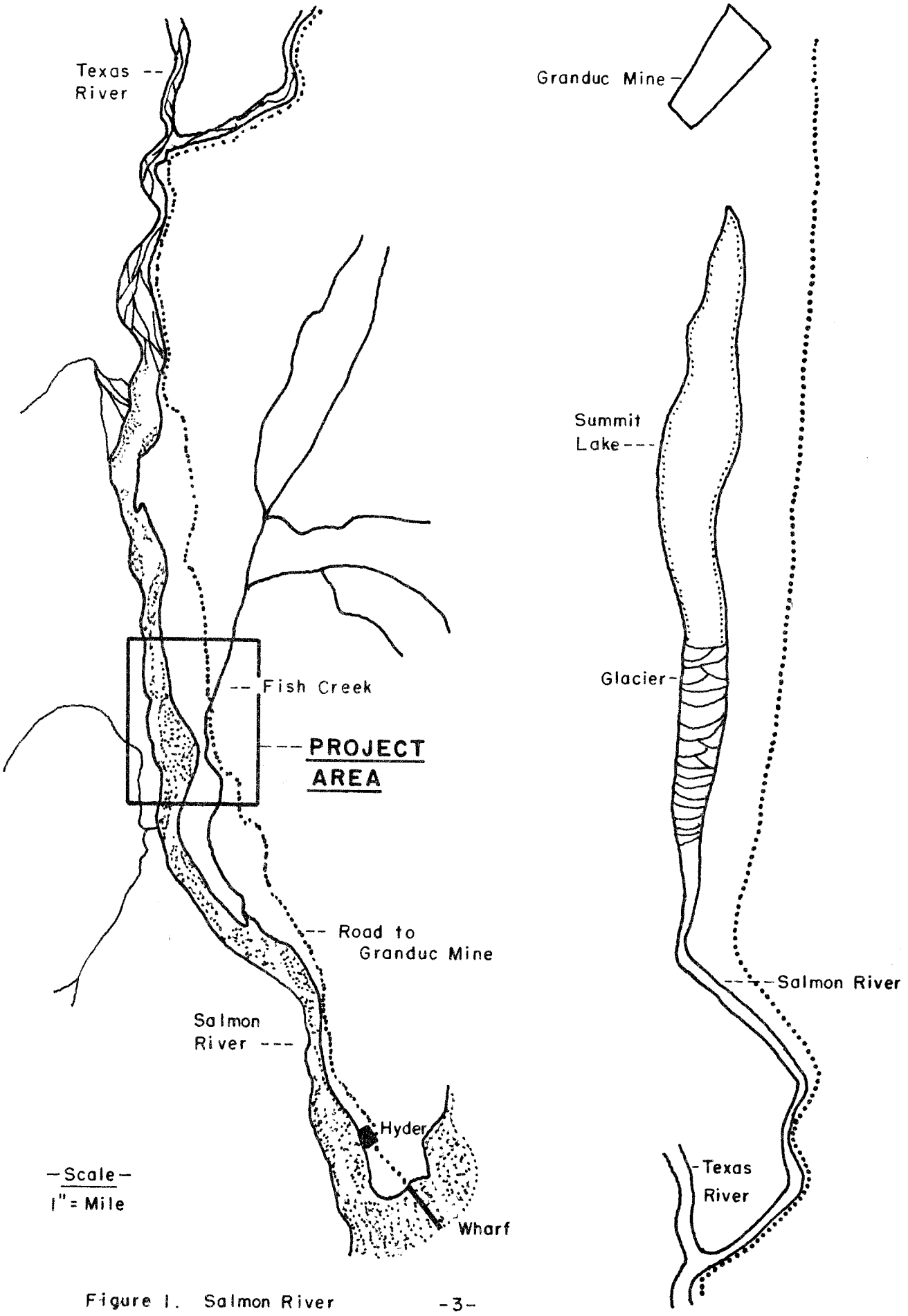

Figure 1. Salmon River

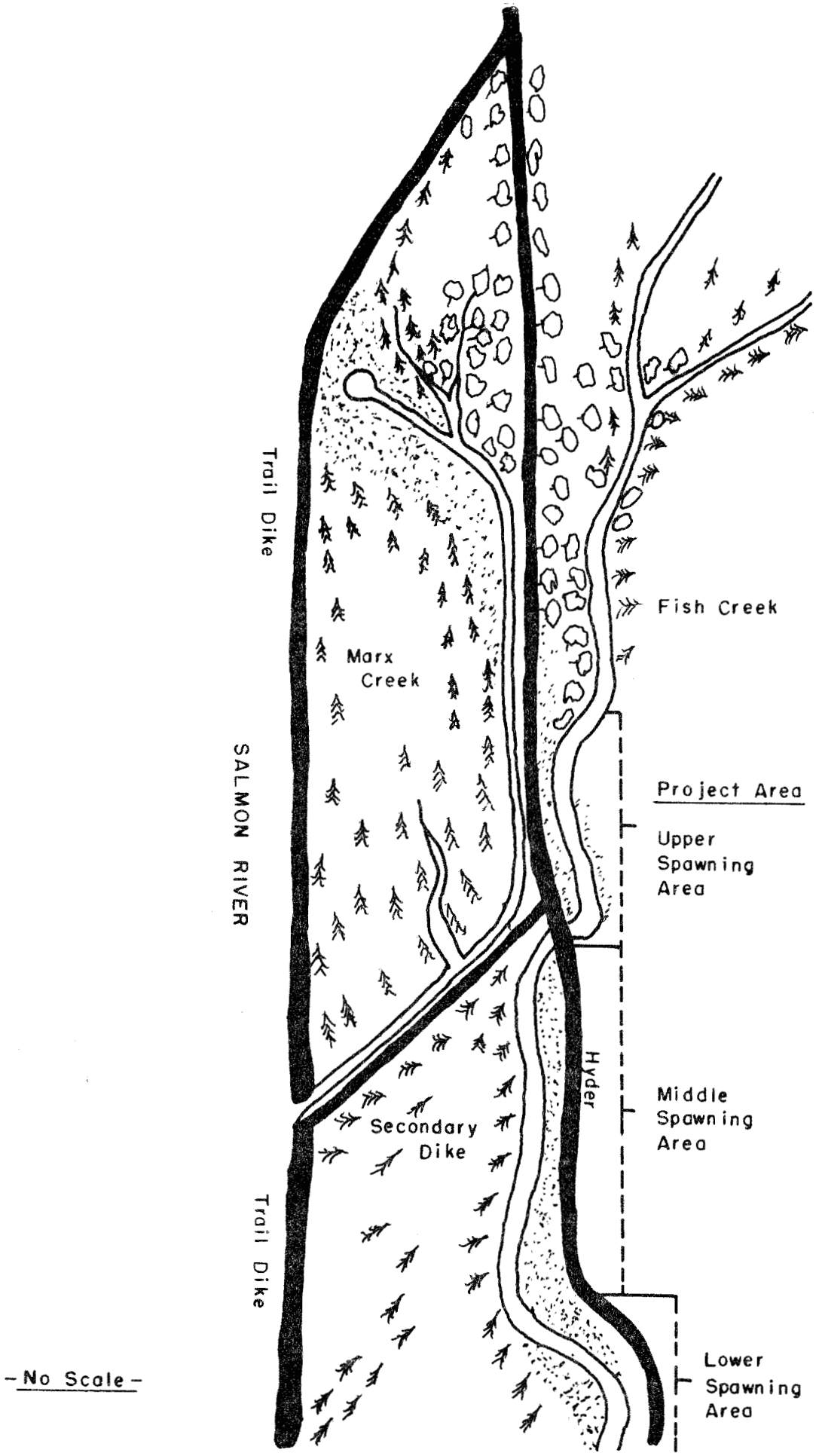

Figure 2. Fish Creek Area

Figure 3. Summit Lake looking toward the glacier on the U.S. Canadian boundary. Low lake levels in July, approximately 15 meters below full pool - "blow out" condition, 1975.

Figure 4. Confluence of Summit Lake and Salmon River Glacier, 1975.

Figure 5. Salmon River glacier under which Summit Lake waters dump into the Salmon River. Outlet tunnel in lower left margin of glacier. 1975.

Figure 6. Salmon River flood plain with typical unstable debris and substrate situations. 1975.

Figure 7. Log jams deposited in 1973, middle spawning area, Fish Creek. 1975.

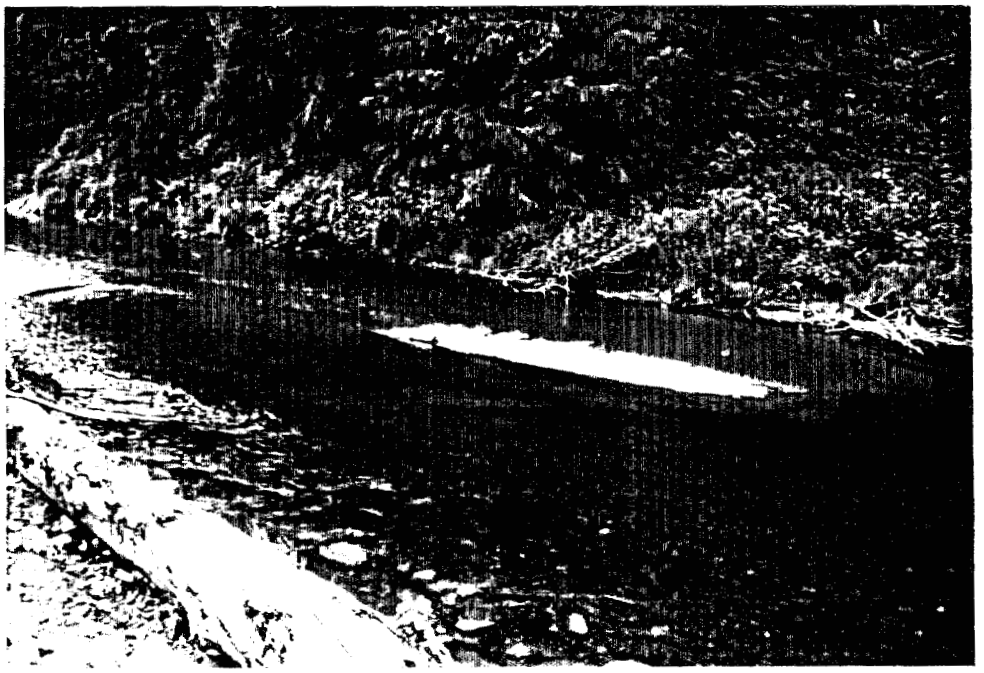

Figure 8. Silt deposits left behind in the upper spawning area from the 1973 flood. 1977.

Figure 9. Removal of log jams. 1977.

Figure 10. Results of 1977 gravel overburden removal and sculpture of stream banks. 1982.

In 1979, FRED and the Department of Highways again cooperated in relocating gravel bars, flushing out fine sediments, and partial removal of a silt clay sill in the middle spawning section.

Stream rehabilitation work continued between cooperating State agencies and the U.S. Forest Service in 1982. Sikes Act monies sponsored removal of a control sill (Figure 11) and effectively reduced hydraulic pressures from the pool formation (Figure 12) to improve upwelling characteristics and encourage fine material flushing. Approximately 0.76 vertical meters of the sill was removed (Figures 13 and 14). Midstream island formations (Figure 15 and 16) were removed from the productive chum salmon spawning areas in Fish Creek. Improvements in the substrate condition were detectable immediately (Figure 17).

Marx Creek Evolution

Dike construction in 1974 created a new drainage (refer to Figure 2) system that has developed over the last 8 years into a recognized chum salmon producing stream -- Marx Creek. Marx Creek had an escapement of only 39 chum salmon in 1979, but in 1982 had an escapement of 2,026 chum and 31 coho salmon.

Instream work on this 3.2 km evolving system included definition of channel (Figures 18 and 19) and improvement of upwelling water collection (Figure 20 and 21) in the headwater area. Channeling the system has improved flow and gradient characteristics, thereby decreasing the fine materials (Figure 22 and 23) in the substrate. Like Fish Creek, the upwelling ground waters in Marx Creek should provide excellent opportunities for high survival (green egg to emigrant fry). Future stream enhancement opportunities at Marx Creek will be planned and investigated by the U.S. Forest Service and the Alaska Department of Fish and Game. Potential exists to:

1) Increase the channel width to 6 or 12 meters in the upper spawning area.

2) Develop headwater collection facilities.

3) Incorporate incubation facilities near the headwaters.

4) Develop spawning controls or weirs for adult density management.

5) Develop flow/gradient weirs.

6) Utilize Fish Creek chum stocks for enhancement options at Marx Creek.

7) Produce 60,000 adult chum salmon annually at Marx Creek.

8) Improve coho rearing and spawning habitat on the lower fork of Marx Creek.

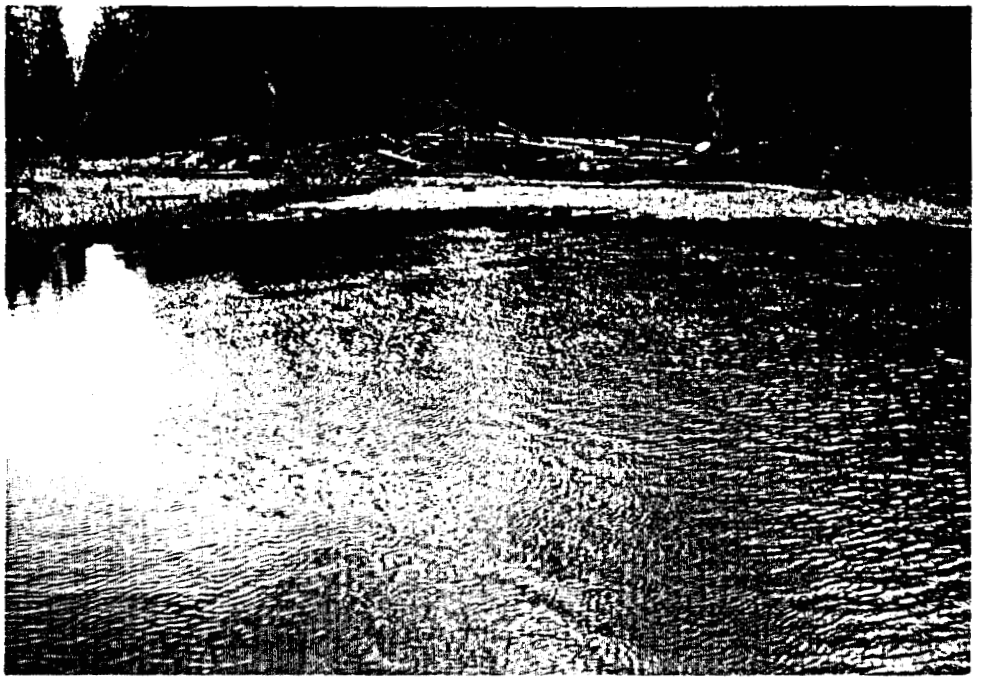

Figure 11. Control sill prior to partial removal in 1982. This 3 foot sill formed a silt ladden pool 250 meters long. 1982.

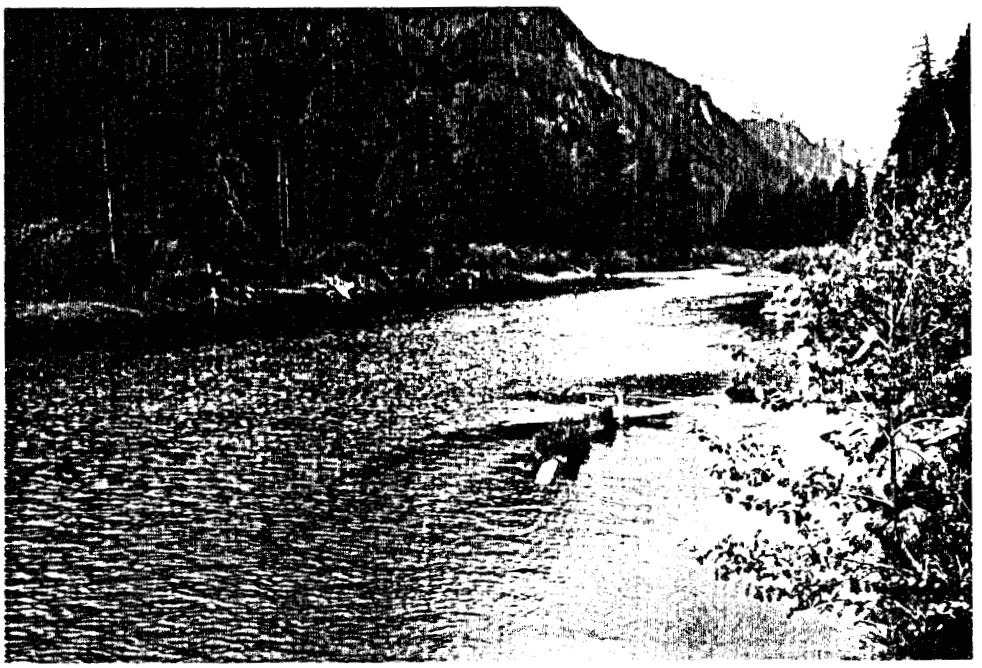

Figure 12. Pool formation above control sill. 1982.

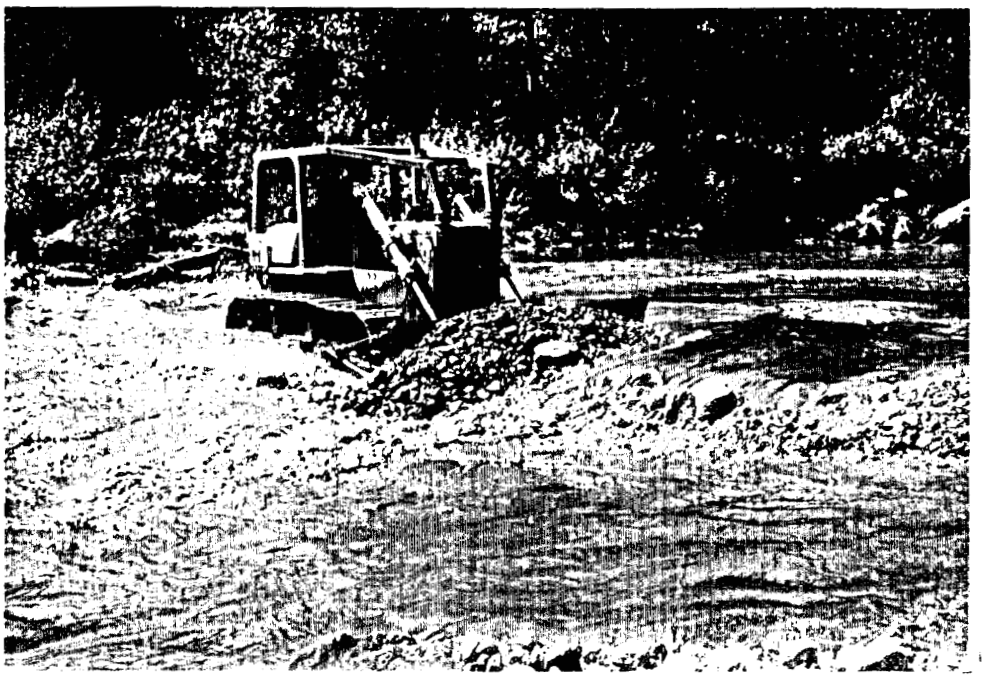

Figure 13. Removal of sill and flood waste deposits. 1982.

Figure 14. Side dressing sill area. 1982.

Figure 15. Midstream island - midsection of spawning area. 1982.

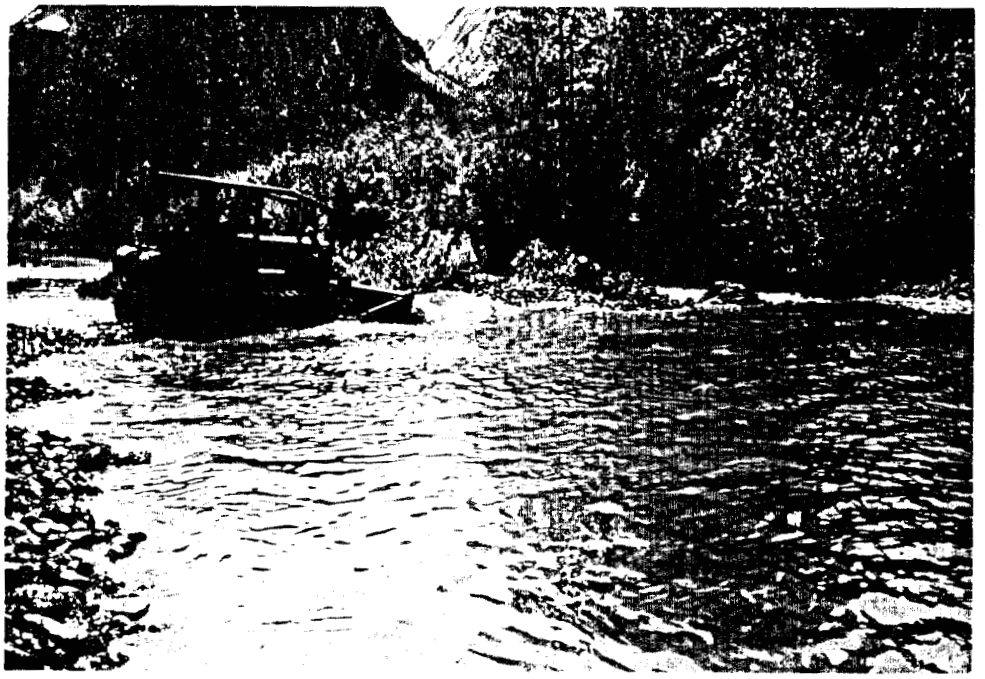

Figure 16. Removal of midstream islands. 1982.

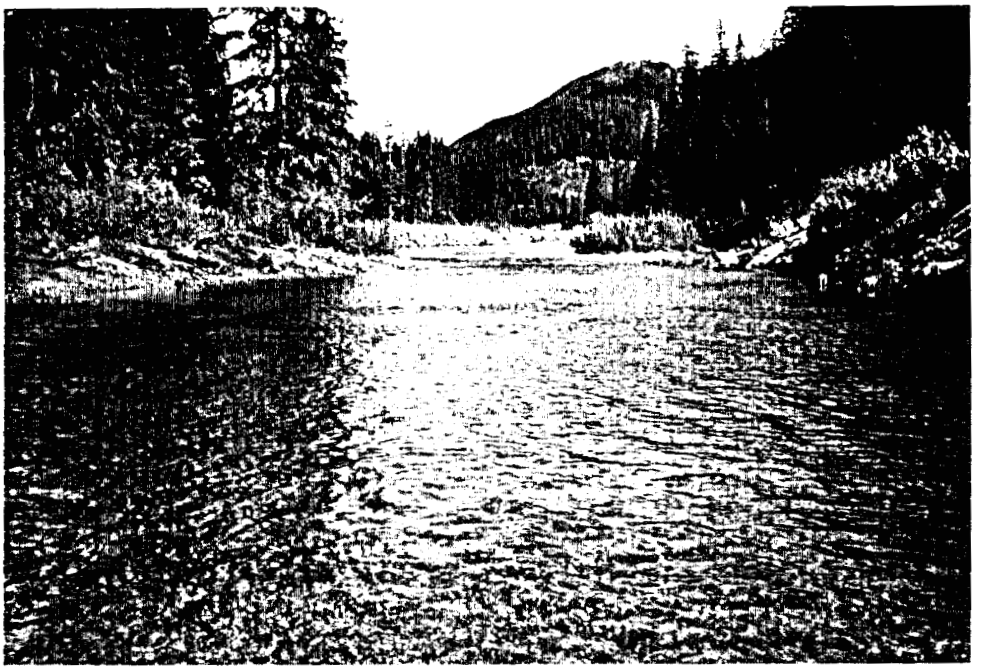

Figure 17. Reclamation of prime spawning area in the midsection, as a result of island removal; same location as Figure 13. 1982.

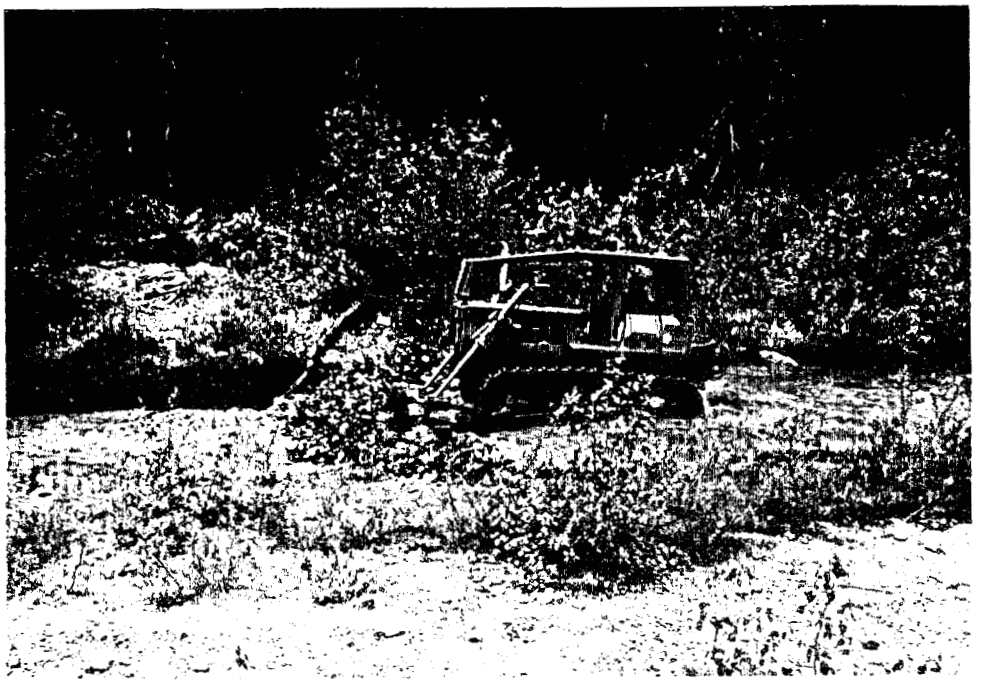

Figure 18. Definition of channel - Marx Creek.

Figure 19. After defining a channel, heavy loads of fine materials were washed out of the system, as a result of improved flows and gradient. 1982.

Figures 20 and 21. Enlargement and deepening of the headwaters of Marx Creek for improvement of upwelling water collection. 1982.

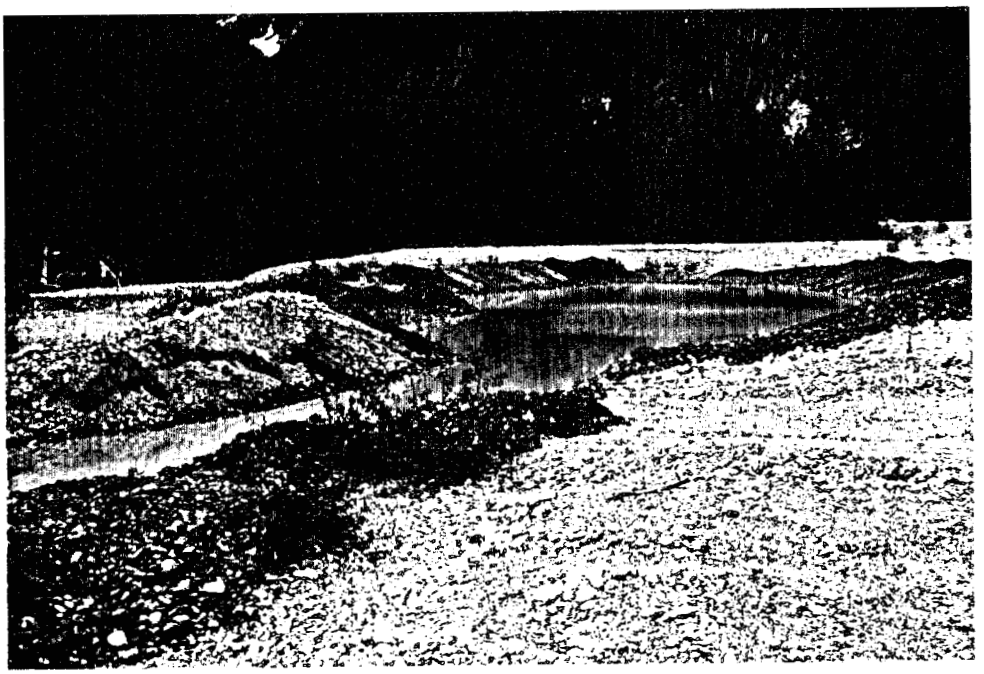

Figure 22. Fine materials common to Marx Creek previous to channelization work completed in 1982. Note the large upwelling flow area in the center of the photo. 1982.

Figure 23. Spawners distributed in the channeled portion of Marx Creek where silt loads were tremendous prior to channeling efforts. 1982.

Fisheries

Evaluation of habitat improvement work at Fish and Marx Creeks were carried out by State agencies in 1982. U.S. Forest Service personnel, under the instruction of Glen Contreras and Bryce Rickel, established sampling stations in both watersheds. Stations were measured from the mouth of Fish Creek to the headwaters. Likewise, stations were established on Marx Creek. Escapement was recorded by station for each species observed. Water temperature was recorded above, below, and within the 1982 improvement project areas. Louis Bartos (1983) reported, from these data, numbers of spawning chum salmon utilizing discrete areas of the project site. He demonstrated spawning preference for areas having a mean velocity of 0.3 m/s and marginal use of areas with measured velocities of 0.79-1.04 m/s. Bartos reported that channel modifications in the enhanced reach, which previously had no spawning potential, had a total of 1,546 spawners.

John H. Helle, National Marine Fisheries Service, has been actively involved with research of the Fish Creek chum salmon since the early 1970s. Helle's escapement summaries (Table 1) demonstrate that preflood chum salmon escapements exceeded other large Southeast Alaska rivers and creek escapements. Disappearance Creek, located on Prince of Wales Island in Cholmondeley Sound, has an annual managed escapement of 30,000 adults, which, historically, have produced associated harvests normally exceeding 100,000 fish. If the mean Fish Creek escapement restabilizes at 29,000 chum salmon and estimated harvest is at 60% and returns per spawner range between 2 to 4:1, Helle and Swanson (1974) estimated that between 35,000 and 70,000 adults will be contributed to the annual commercial fishery. Since 1974, flood waters have been kept out of the Fish Creek watershed as a result of the dike system. Escapements have fluctuated as a direct result of intense interception fisheries by both United States and Canada. Poor marine survival is also thought to be responsible for the less than average escapement in 1981; returning adult, age 4, chum salmon were extremely poor across Southeast Alaska. Table 2 defines annual escapement after effective flood protection.

RECOMMENDATIONS

Annual maintenance of the spawning gravels within the defined project area is suggested to keep fine materials from reducing the upwelling features of these productive areas. Blading the substrate to a minimal depth of 46 cm should suspend these materials and result in their being flushed out of the system. These activities will also remove any organic loads and maintain the desired gradient.

Additional work in the lower Fish Creek watershed will involve log jam removals and beaver dam remodeling. Fine materials appear to be the major problem associated with the productivity of lower Fish Creek. Reestablishing the natural gradient and flow regimes will improve the movement of fine materials out of the system.

Table 1. Escapement estimates of chum salmon in Fish Creek prior to flooding and during flooding.

Total Escapement (2.5 times peak count)		
Year	Number of Fish	
1956	50,000	
1962	95,000	Preflood
1963	750	Flood Years
1968	11,500	
1969	67,500	
1970	3,750	
1971	9,000	
1972	18,250	
1973	8,000	
Mean	29,000	

Table 2. Escapement estimates of chum and coho salmon (2.5 times peak count for chum only) after effective flood control, Fish Creek.

Year	Species	Number of Fish
1974	Chum	20,000
1975	Chum	3,250
1976	Chum	6,750
1977	Chum	21,250
1978	Chum	8,500
1979	Chum	49,000
1980	Chum	23,000
1981	Chum	4,500
1982	Chum	14,505
1982	Coho	675

Engineers and hydrologists are planning for removal of an additional 0.30 meter of the vertical sill in the lower spawning area. This action will improve gradient and lateral flow conditions and should reestablish natural upwelling in the area.

Control of airborne materials from the road system is another influencing source that needs attention. Application of nontoxic wetting compounds or oiling the road section adjacent to Fish and Marx Creek may be advisable.

Marx Creek enhancement options will be studied in more detail in 1983. Additional work will basically involve engineering and hydrology studies to identify long-term enhancement options associated with spawning channel alternatives.

REFERENCES

Bartos, Louis R. 1983. Stream Channel Modification for Spawning Bed Enhancement. USDA Forest Service Report, Ketchikan Area, Tongass National Forest, Alaska.

Helle, John H. and S.D. Swanson. 1974. Some Estimates of the Value of the Harvest of Chum Salmon from Fish Creek, near Hyder, Alaska. Unpublished report by National Marine Fisheries Service and Alaska Department of Fish and Game, Juneau, Alaska.

Helle, John H. Age and Size at Maturity of Some Populations of Chum Salmon in North America in P.A. Moiseav (ed.) Proceedings of International Conference on Biology of Pacific Salmon. Yuzhno-Sakhalinsk, USSR, 3-13 October 1978. Reprints available from Northwest and Alaska Fisheries Center, Auke Bay Laboratory, National Marine Fisheries Service, NOAA. P.O. Box 155, Auke Bay, Alaska 99821.

ACKNOWLEDGEMENTS

The author would like to express appreciation to the Alaska Department of Transportation and Public Facilities, United States Department of Agriculture, Forest Service, and the National Marine Fisheries Service for their cooperation with the Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement, and Development (FRED) for support given to this project. Special thanks go to Bob Whitton, and Don and Lawrence Marx for their special treatment of the fishery resources at Fish Creek.